Surrounding the Requirements Process

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ESERG Workshop on Software Engineering, September 2002

Bournemouth University

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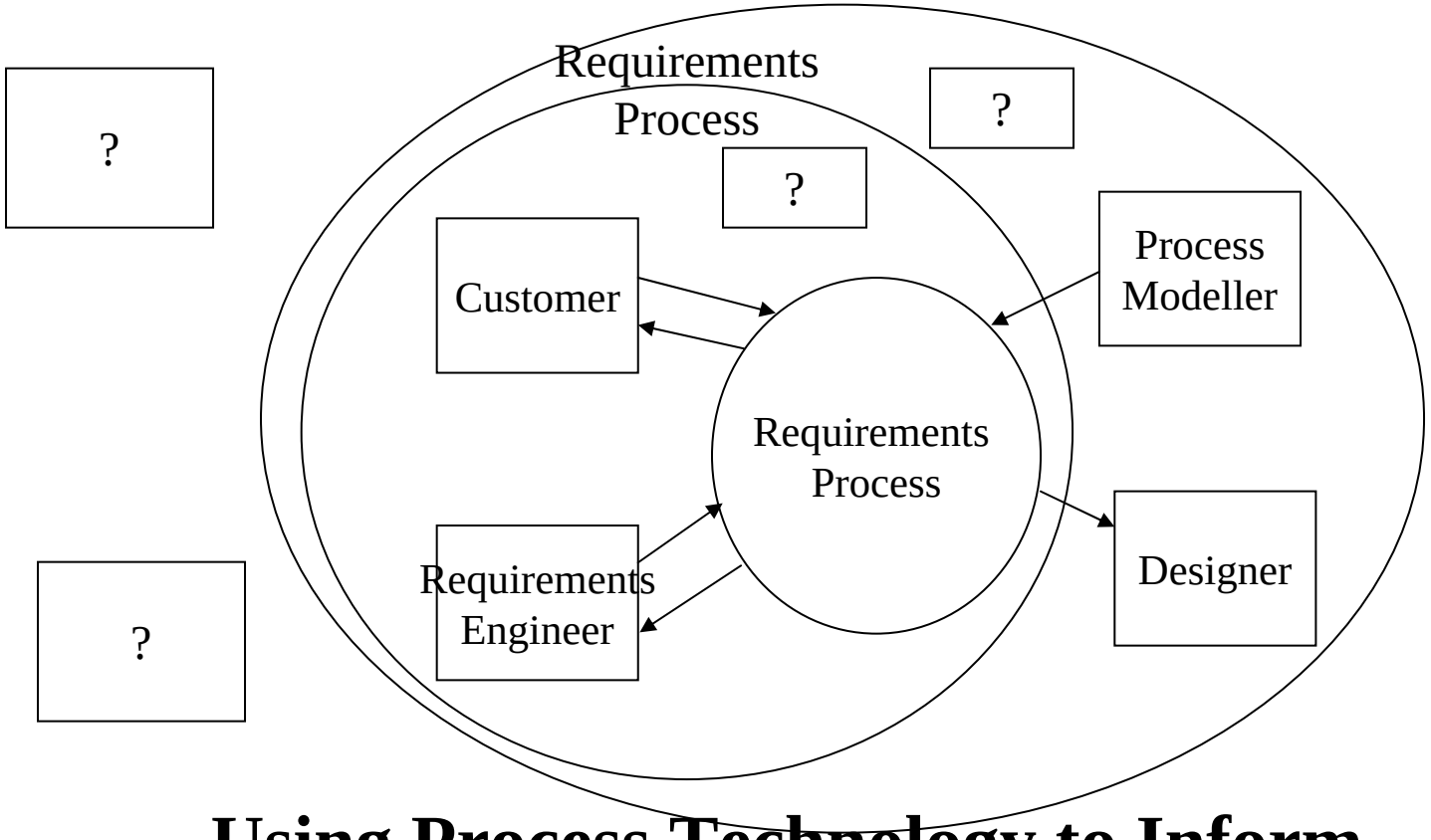


Using Process Technology to Inform Requirements

Keith Phalp

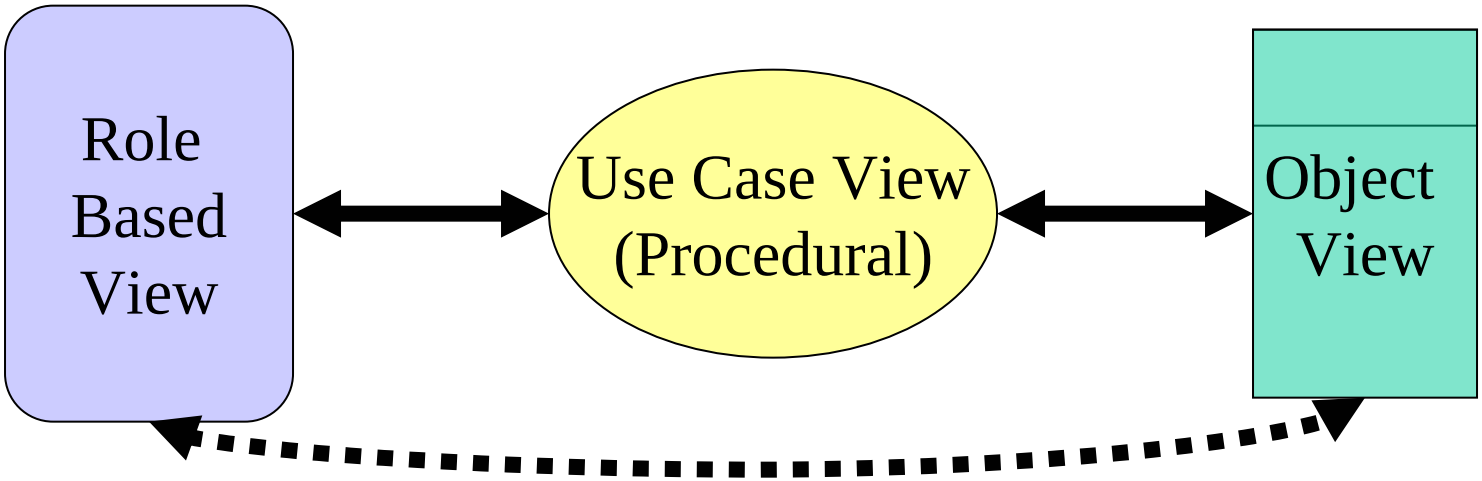
Overview: A game of two halves

- Assuming a use case approach
- Two themes
  - Using process models (directly) to inform the use case. (*I know what about PDOA?)*
  - Using process modelling technology (ideas really) to support the use case.
- Consider rationale for each and progress (very early days)

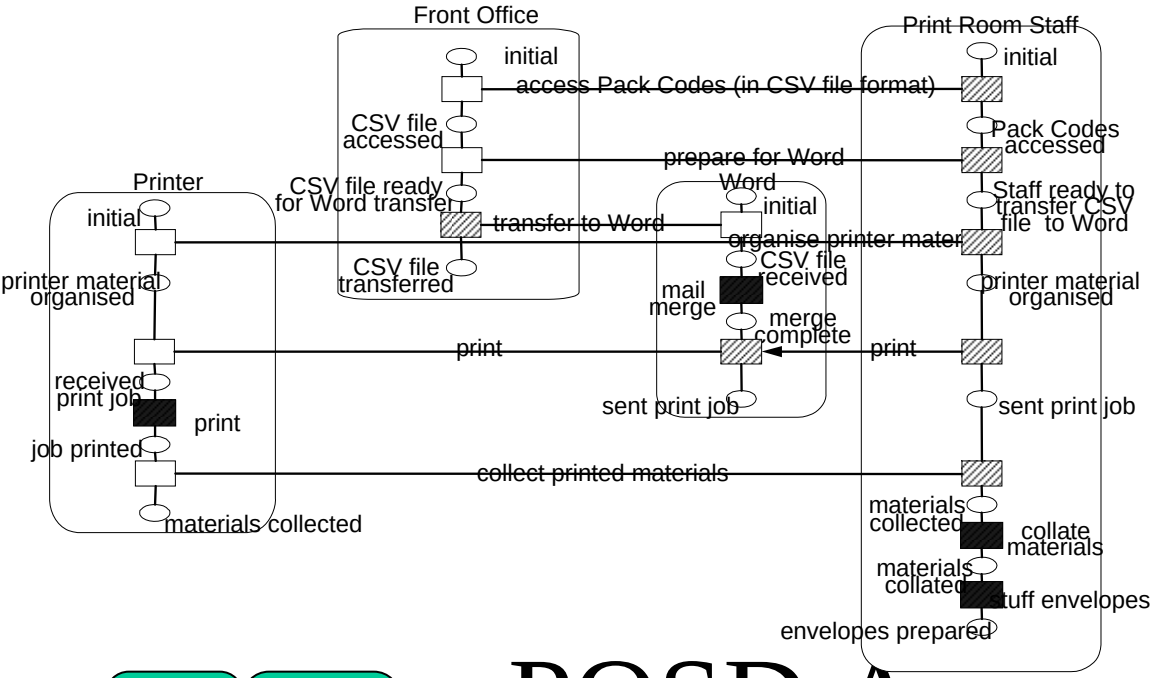
Use Case based requirements Questions

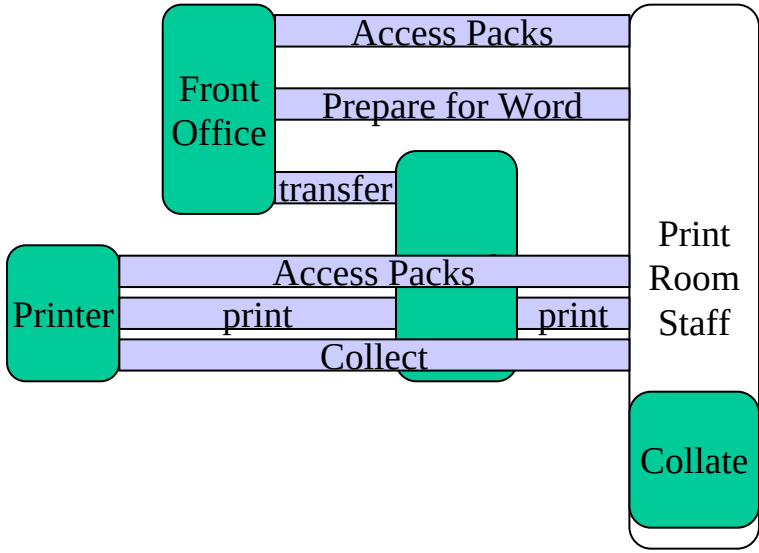
- Where does the UC description come from?
  - Previous documents elicitation notes / invention / domain analysis / ***process models***.
- How do we improve the description?
  - Initial writing, *analysis, revision and validation*.
- How do we (best) support these activities?
- Where does the UC description go?
  - For whom? For what purpose? Impact of audience.

Mappings

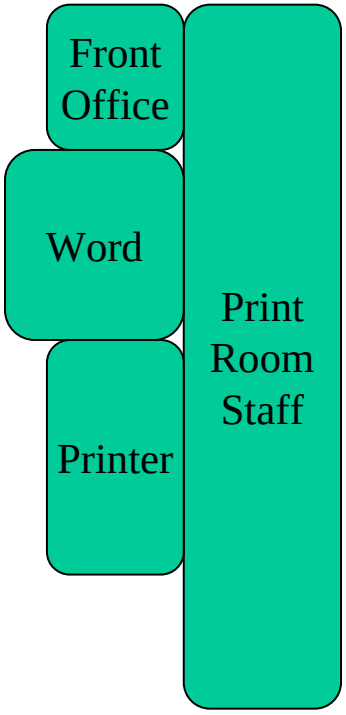


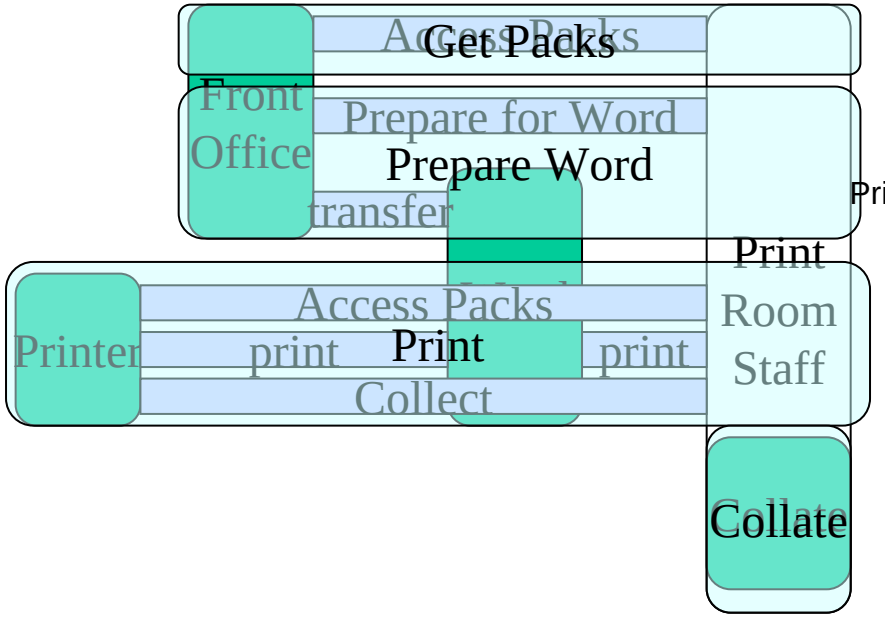
- Difficult to preserve mapping when notations are orthogonal.
  - Sometimes utilise further (structuring and overview) notations, such as POSD.

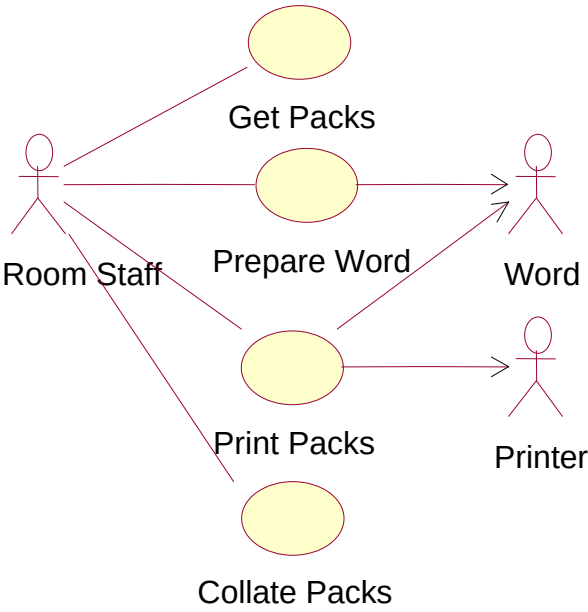




POSD Approach







- Examine connections among roles.
  - Much activity within connections.
- Describe (or group) the genuinely ‘shared behaviours’.
  - Roles sharing sets of interactions are candidates for grouping.
- Group activities with ‘related’ content.
  - (both interactions and actions).
- *Must preserve connections ‘promises’.*
- Processes (or roles and actors) become use cases.

Guidance / lessons

- Roles often become actors.
- Reduce system roles.
- Reduce process mechanism.
- Beware inconsistent levels of abstraction.
  - E.g., single interactions OR
  - Multiple actions and interactions as a Use Case.
- Moving from process to specification.
  - Hence, some process elements may not be described.

Observations: Process so far

- RAD phase helps ‘debug’ process.
  - Checklist for activities in the use case description.
  - Describes *dependencies* among activities.
  - POSD provides guidance for use cases diagram.
  - POSD allows further scope for viewpoints.
  - Mapping helps ensure that detail is not omitted.
- Presumes process models and requires effort.
  - Though these are models of the application domain (isn’t that requirements).
  - Doesn’t bring in other opportunities (e.g., frames).
  - Time a problem for industrial application.

Next Steps: Use Cases onwards

- Have moved from process description to use case diagram.
- Use cases help identify packages.
- Each Use case has associated description.
- From descriptions we discover objects.
  - By asking sets of questions.
  - By refining descriptions.
  - *By considering dependencies*
  - *By running models{**enaction**}.*

What (else) is wrong with use case description anyway

- No details about the dependencies of actions.
- Consider a generic use case (CP rules)
  - SubjectA verb1 ObjectX
  - SubjectB verb2 ObjectY
  - SubjectC verb3 ObjectZ
- Under what circumstances does verb3 occur?
  - Dependent on verb2 or verb1 or neither?
  - Danger of assumptions?
- Importance of validation and domain knowledge.

Two sporting use cases

1. The match reached full-time
2. The ball crossed the goal-line
3. The referee blew his/her whistle
4. The goal was given

Alternatives

4. The goal was not given

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Validation & Context. Someone who ‘knows the the game’.

Use Case 1: Enter Car Park

- **Actors:** Driver
- **Context:** The Driver wants to park in the local "Regional Car Park" so the Driver can go shopping.
- **Pre-condition:** There are parking spaces available inside the car park.
  - *(How do we know?)*
- **Post condition:** There is one less space available inside the car park.

Main flow of events:

1. The *Driver* drives to the ticket machine.
2. The *Driver* presses the ticket button.
3. The *ticket machine* dispenses a ticket.
4. The *Driver* takes the ticket.
5. The *entry barrier* raises.
6. The *Driver* drives into the car park.
7. The *entry barrier* lowers.
8. The *Driver* parks the car.

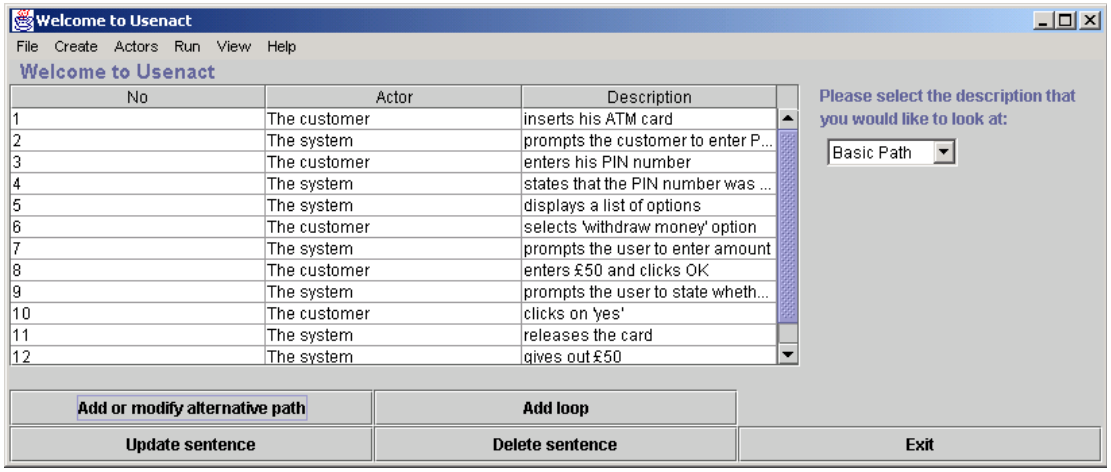
Exceptional flow of events:

3. The ticket machine fails to dispense a ticket. The Driver calls for assistance.

```
Selection Driver.driveOverPad
   Me( initial -> DriverAtMachine )
   EntryPad( initial -> overPad )
End

Selection EntryPad.PadNotify
   Me( overPad -> initial )
   TicketMachine( initial -> CarAtMachine)
End

Selection Driver.PressForTicket
   Me( DriverAtMachine  -> ticketRequested )
   TicketMachine( CarAtMachine -> ticketRequested )
End

Selection TicketMachine.Dispense
   Me( ticketRequest -> ticketDispensed )
   Ticket ( initial -> date_stamped )
End

Interaction Driver.TakeTicket
   Me( ticketRequested -> ticketTaken)
   TicketMachine( ticketDispensed -> ticketTaken )
```

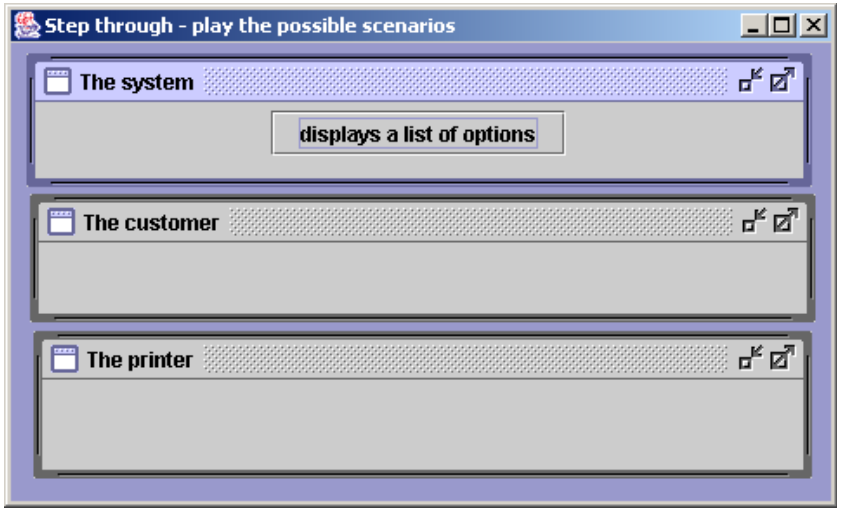
Object States: Formal

- Dependencies for 1 to 4.
- States act as pre / post conditions.
- E.,g., for driver to take ***ticket*** it must have been dispensed.
- Ticket not from behaviour, but a data object.
- and so on...



A tool for use case enaction

- Write ‘sunny day’ scenario.
  - Add alternatives or exceptions.
  - Add actors when required.
- ‘Step through’ the use case.
  - Generated from description.
- Provide (some) guidance.
- Other opportunities
  - organise, link & synchronize multiple use cases, provide measures & estimates…



Where now?

- Developing (and extending) tool support for UC descriptions.
- Formalise mapping ideas.
- UC tool (and enaction) suggests need at process stage for better tool support:
  - Automatic enaction for validation
  - Bundling behaviours
    - (or moving straight to design). *Process Oriented Systems Design.*
  - Support for use case generation
- Round in circles again.

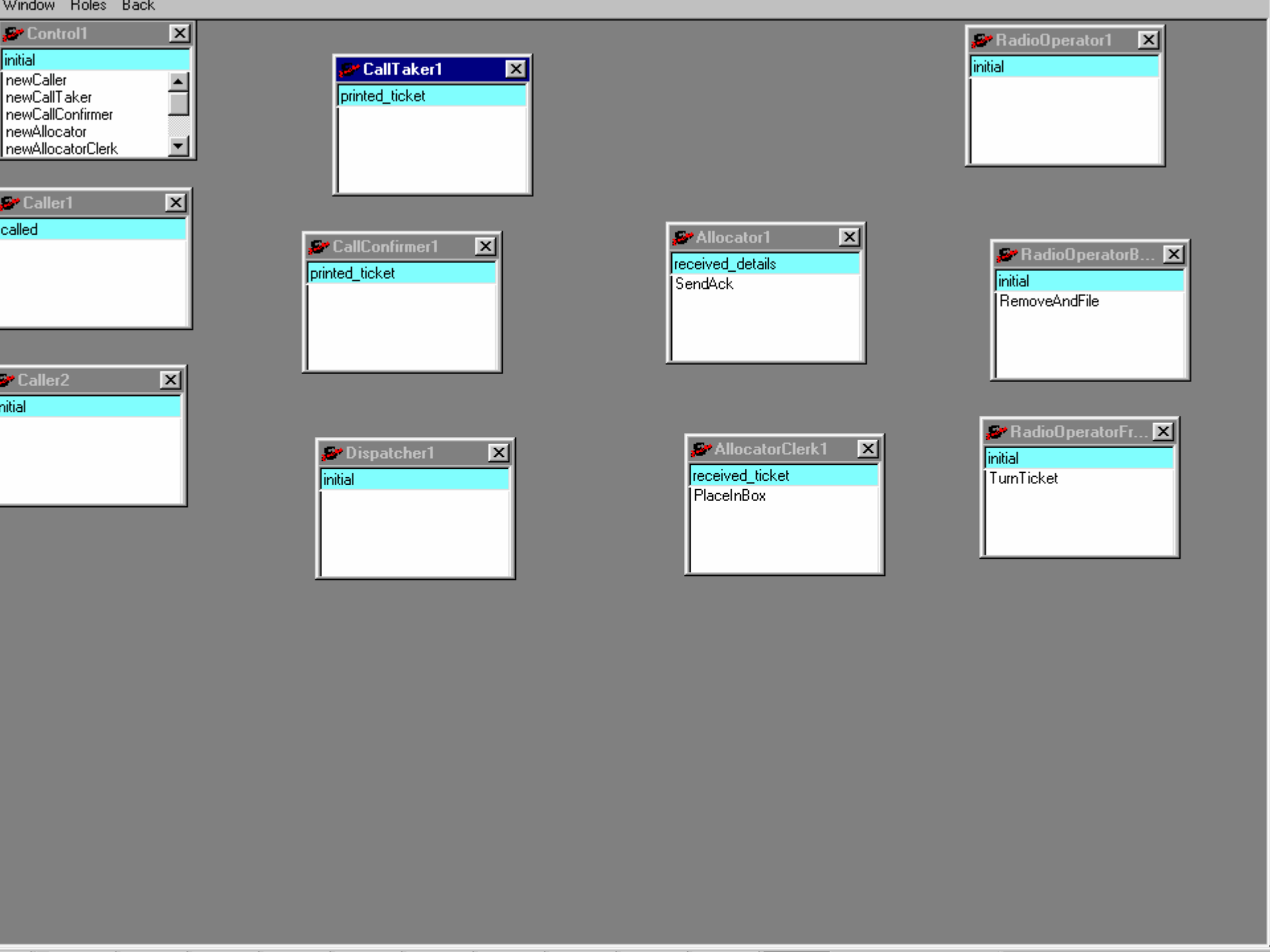
Spare Slides

Opportunities

- Portions of business process models may map to subsequent documents?
  - *RADs to use cases (larger scale) - using POSD.*
  - Avoid use cases (RADs to interface / design).
- *Business process technology (e.g., state-based, enaction) may be useful in supporting Use Case description.*
- Use cases could be ‘interrogated’ to provide information to subsequent phases.

Enactable Use case for validation

- Process modelling experience:
  - State based approaches allow consideration of dependencies.
  - Annotate models with states.
  - Step through states with computer models.
- Hence, used this approach to produce enactable equivalents of use cases.
  - RolEnact (equivalent) to use case descriptions.
- Note original (RolEnact) + prototype tool.


Window Roles Back
Control1
initial
newCaller
newCallTaker
newCallConfirmer
newAllocator
newAllocatorClerk
CallTaker1
printed_ticket
RadioOperator1
initial
Caller1
called
CallConfirmer1
printed_ticket
Allocator1
received_details
SendAck
RadioOperatorB...
initial
RemoveAndFile
Caller2
itial
Dispatcher1
initial
AllocatorClerk1
received_ticket
PlaceInBox
RadioOperatorFr...
initial
TurnTicket

Experience of Producing RolEnact equivalent to use cases

- Student subjects: SDM + Integrating Studies programmes.
  - Students coped relatively easily with language.
  - Aided validation. Increased understanding, clarified issues.
  - Also (bonus) *teased out design issues* (post-UCD).
- Projects (RolEnact): legal system, record & billing system.
- Significant overhead. **Too time-consuming**.
- Need for tool support. (May incorporate other ideas too).